Abandoned Uranium Mine Site Assessment for the Mary No. 1 Site (NM0095)

FINAL REPORT

Prepared For:

New Mexico Energy, Minerals and
Natural Resources Department
Wendell Chino Building
1220 South St. Francis Drive
Santa Fe, New Mexico 87505

Prepared By:

INTERA

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NM0095

9746770

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1.0 INTRODUCTION

INTERA Incorporated (INTERA) has prepared this Abandoned Uranium Mine (AUM) Site Assessment Report for the Mining and Minerals Division (MMD) of the New Mexico Energy, Minerals and Natural Resources Department (EMNRD) in compliance with the Professional Service Agreement dated November 2, 2009. INTERA visited the Mary No. 1 Site (AUM Site), MMD ID: NM0095 on April 9, 2010.

1.1 PREVIOUSLY KNOWN INFORMATION ABOUT THE SITE

Anderson (1980) visited the AUM Site in 1980 and found a 500 ft deep shaft that had caved in to form a 75 ft deep funnel-shaped hole. A region of low waste rock piles extended 600 ft from the shaft. A small powder magazine was also found. The Mary No. 1 mine was sunk in 1959 and was last registered at the State Mine Inspector's Office in 1966 (Anderson, 1980). The target rock was the Westwater Canyon Member of the Jurassic-age Morrison Formation. The mine yielded 357,262 tons of ore (McLemore, 1983).

1.2 SITE LOCATION AND DIRECTIONS

The AUM Site is on private land in the northwest quarter of Section 11, Township 14 North, Range 10 West. The Site is located in McKinley County, approximately 19 miles north of the town of Milan. The location of this Site was provided to INTERA by MMD.

To access the AUM Site from Albuquerque, drive west on Interstate 40 for 83 miles. Take Exit 79 towards San Mateo and turn right. Continue straight until you reach U. S. 66, less than a quarter mile. Turn left on U.S. 66 and drive 0.2 miles, then turn right onto New Mexico 605. Continue northeast on New Mexico 605 for approximately 13.8 miles, then turn left on New Mexico 509 (Ambrosia Lake Road). Continue on New Mexico 509 for 7.3 miles, then turn left, passing through a locked gate. At this point, the road will change from paved to dirt. Travel along the main dirt road northwest for another 2 miles, crossing railroad tracks. After 2 miles, the road turns to the southwest, but a faint two-track continues north-northwest. Take this two-track road until it ends at a steep-sided arroyo and continue on foot to the AUM Site.

Note that permission from one private landowner is required to travel along the access road, and permission from another private landowner is required to view the Site itself.

1.3 SITE GEOLOGY

The AUM site lies within the Grants uranium region. The topography of this region is characterized by mesas of Triassic to Cretaceous strata separated by broad valleys. The Site area is part of the Chaco Slope, the southern part of the San Juan Basin. Strata in the Chaco Slope dip gently to the north (McLemore, 2002).

Underground mining activities at the AUM Site targeted the Westwater Canyon Member of the Jurassic Morrison Formation. This member is believed to have been deposited by northward flowing streams draining a highland to the south. It is underlain by the Recapture Member of the Morrison Formation, a series of alternating beds of sandstone and mudstone. The Westwater Canyon Member is overlain by the Brushy Basin Formation, a layer of mudstone with some

sandstones and limestones. The Westwater Canyon Member is a fine to coarse grained, poorly sorted, crossbedded sandstone with occasional gravel lags and petrified logs (Hilpert, 1963).

Ore deposits at the nearby Dysart No. 1 mine consisted of black primary uranium minerals with some yellow secondary mineralization. Other occurrences included molybdenum minerals and native selenium. Most uranium ore bodies in the mine trended roughly north-south along fractures (Cronk, 1963). Uranium ore bodies in the Mary No. 1 mine were also associated with fractures (Anderson, 1980).

1.4 SITE HYDROGEOLOGY

The surface runoff at the AUM Site discharges to Martin Draw. Martin Draw joins Arroyo del Puerto, which drains into San Mateo Creek approximately 9 miles southeast of the AUM Site. There is no nearby permanent surface water.

The AUM Site is located in the Bluewater Underground Water Basin. This basin falls between the San Juan Underground Water Basin to the north, the Middle Rio Grande Underground Water Basin to the south and east, and the Gallup Underground Water Basin to the west (Edwards and Kiely, 2004). Aquifers are found in alluvium near major drainages such as San Mateo Creek and throughout the Cretaceous, Jurassic, and Triassic strata in the region. Groundwater flows southward in alluvium and northeast in Mesozoic strata (Brod, 1979).

1.5 REGIONAL TOPOGRAPHY AND TERRAIN

The AUM Site is found on the Ambrosia Lake Quadrangle 7.5 minute United States Geological Survey topographic map at an elevation of approximately 7100 feet above mean sea level (see Figure 2). The AUM Site is located in a broad, alluvium-filled valley surrounded by small, isolated mesas capped by Mesozoic strata.

2.0 MINE FEATURES

The mine features described below are based on the features provided to INTERA by MMD in the GIS Data Dictionary (MMD, 2009). INTERA marked the locations of the AUM Site features using a Trimble Global Positioning System (GPS), and entered details about the features into the GPS using the MMD data dictionary. One area of disturbed ground and one vent shaft were found onsite. Please see the Photo Log in Appendix A for photos of the AUM Site features, Table 1 for a list of the AUM Site features, and Figures 4a and 4b for the locations of the AUM Site features.

2.1 MINE SHAFTS, ADITS, AND DECLINES

No mine shafts, adits, or declines were found at the AUM Site. A collapsed shaft was recorded at the Site by Anderson (1980) but this shaft was later reclaimed. Al Cox of Homestake indicated that DistPly-1 is the location of the former shaft.

2.2 MINING AND EXPLORATION PITS AND OPEN CUTS

No pits or open cuts were found at the AUM Site.

2.3 WASTE AND ORE PILES AND DISTURBANCES

One disturbed area (DistPly-1) was found onsite. This disturbance consists of a low, flat-topped mound of dirt 60 ft across by 90 ft long (see Photos 1-5 in Appendix A). A vent shaft (MiscPt-1) is located in the center of this disturbance. The maximum gamma radiation measured at the disturbance was 19 µR/hr at 4 ft above ground level at radiation survey point Rad-2.

2.4 MINING RELATED BUILDINGS AND FOUNDATIONS

No mining related buildings or foundations were found at the AUM Site.

2.5 OTHER MINE FEATURES

A vent shaft (MiscPt-1) was discovered in the center of DistPly-1 (see Photos 4 and 5 in Appendix A). This vent consists of a PVC pipe within a larger metal casing. The depth of the vent shaft could not be ascertained.

2.6 BOREHOLES

No boreholes were found at the AUM Site.

2.7 RECLAMATION ACTIVITIES

Extensive reclamation activity, including the infilling of the caved shaft, removal of a powder magazine, and removal of waste piles has taken place since Anderson (1980) visited the Site, according to Al Cox, a project manager with Homestake Mining Company. Power lines, tires, and other debris visible in photos from Anderson (1980) were not found during the present survey.

3.0 ARCHEOLOGICAL SITES

No apparent archeological sites were identified at or near this AUM Site.

4.0 SITE GAMMA RADIATION READINGS

One background gamma radiation reading was taken near the AUM Site, recording 16 µR/hr at 0 ft above ground and 16 µR/hr at 4 ft above ground. Please see Table 2 for all of the gamma radiation readings taken at the AUM Site and Figures 4a and 4b for the locations of the radiation readings.

Six radiation survey points (Rad-2, Rad-3, Rad-4, Rad-5, Rad-6, and Rad-7) were taken on disturbed ground onsite (DistPly-1). The maximum gamma radiation measured was 19 µR/hr at 4 ft above ground at radiation survey point Rad-2.

The maximum gamma radiation reading for the AUM Site was 45 µR/hr at 0 ft above ground at radiation survey point Rad-11, located on the MMD provided shapefile polygon. No other radiation survey points had gamma radiation readings above 20 µR/hr.

5.0 CURRENT LAND USES

5.1 HUMAN ACTIVITY AND RECREATIONAL SITE USE

Barbed wire fences in the surrounding area and cow prints indicate that the area is active ranchland.

5.2 NEARBY RESIDENTIAL, COMMERCIAL AND INDUSTRIAL STRUCTURES

No structures were sighted within a mile of the AUM Site.

5.3 NEARBY DOMESTIC WELLS

There are no wells, domestic or otherwise, within a mile of the AUM Site.

5.4 EVIDENCE OF GRAZING OR AGRICULTURE

Barbed wire fences in the surrounding area and cow prints indicate that the area is being grazed.

5.5 EVIDENCE OF WILDLIFE

Evidence of cottontail and jackrabbits were found on the AUM Site.

6.0 VEGETATION

The AUM Site is located in the Coniferous and Mixed Woodland vegetation type, bordering the Juniper Savanna (Ecotone). The Site has more grassland than woodland vegetation. Due to the time of year and the excessive grazing onsite, no grass or forb species could be identified except for Kochia seedlings. Positively identified woody species included prickly pear cactus and snakeweed.

7.0 POTENTIAL OFFSITE IMPACTS

7.1 EROSION

No evidence of erosion was observed onsite.

7.2 ENVIRONMENTAL IMPACTS

There is no evidence of soil staining from chemicals potentially brought to the AUM Site.

8.0 REFERENCES

Anderson, Orin J., 1980. Abandoned or Inactive Uranium Mines in New Mexico. New Mexico Bureau of Mines and Mineral Resources Open File Report 148.

Brod, Robert C., 1979. Hydrogeology and Water Resources of the Ambrosia Lake-San Mateo Area, McKinley and Valencia Counties, New Mexico. Master's thesis. New Mexico Institute of Mining and Technology, Socorro, New Mexico.

Cox, Al. Personal communication. April 9, 2010.

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Edwards, Mark H. and Kiely, Jeffrey, 2004. Cibola-McKinley Regional Water Plan. Prepared for the New Mexico Interstate Stream Commission.

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Lotspeich, George. Personal communication. April 9, 2010.

McLemore, Virginia T., 2002. Navajo Lake State Park: New Mexico Geology, v. 24, no. 3, p. 91-96,103.

McLemore, Virginia T., 1983. Uranium and Thorium Occurrences in New Mexico: Geology, Production, and Resources, with Selected Bibliography. New Mexico Bureau of Mines and Mineral Resources Open File Report 183.

Mining and Minerals Division (MMD), 2009. Mine Feature Data Dictionary.

TABLES

Table 1
Site Features

Mary No. 1-NM0095
Abandoned Uranium Mine Assessments

Feature Name	On Site?	Feature Type	Associated Feature	Material	Height or Depth (ft)	Width or Diameter (ft)	Length (ft)	Open	Collapsed	Closure Type	Associated Photo	Notes
Access-1	No	Access	--	Dirt	--	--	--	--	--	--	--	--
Access-2	No	Access	--	Dirt	--	--	--	--	--	--	--	--
Access-3	No	Access	--	Dirt	--	--	--	--	--	--	--	--
DistPly-1	Yes	Other	--	--	2	60	90	--	--	--	NM0095_001 NM0095_002 NM0095_003 NM0095_004	--
MiscPt-1	Yes	Vent shaft	--	--	--	--	--	--	--	--	NM0095_004 NM0095_005	5 inch PVC pipe visible at bottom of hole

Notes:
-- designates no information

Table 2
Gamma Radiation Survey Results

Mary No. 1-NM0095
Abandoned Uranium Mine Assessments

Reading ID	0 ft (µR/hr)	4 ft (µR/hr)	Associated Photo	Asssociated Feature
Rad-1	17	17	--	MiscPt-1
Rad-2	18	19	--	DistPly-1
Rad-3	16	16	--	DistPly-1
Rad-4	17	16	--	DistPly-1
Rad-5	15	15	--	DistPly-1
Rad-6	16	16	--	DistPly-1
Rad-7	17	16	--	DistPly-1
Rad-8	16	16	--	--
Rad-9	17	16	--	--
Rad-10	16	16	--	--
Rad-11	39	45	--	--
RadBack-1	16	16	--	--

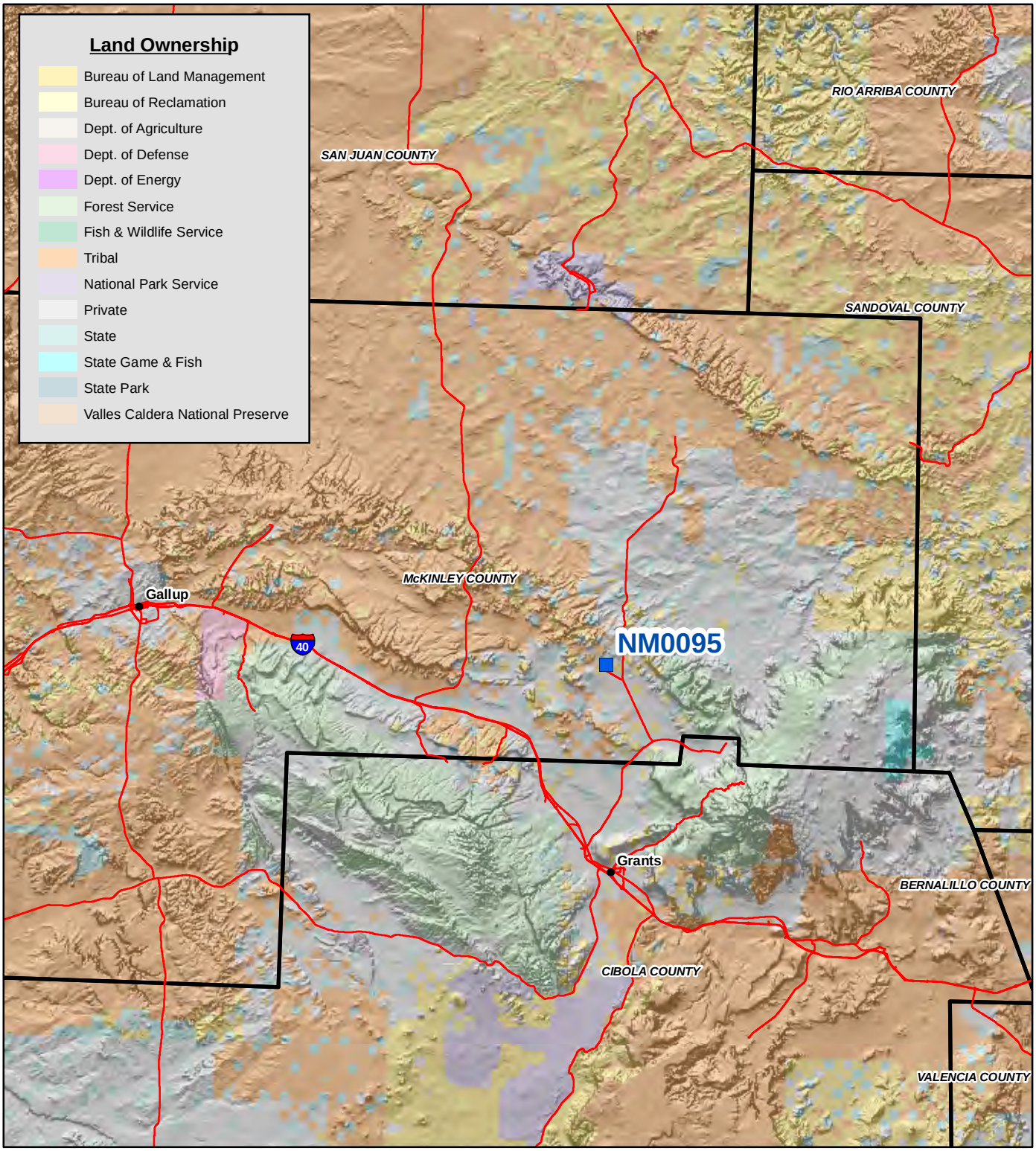
Notes:

All gamma readings at this site taken by Ludlum 192 µR/Ratemeter

µR/hr=microroetgens per hour

-- designates no information

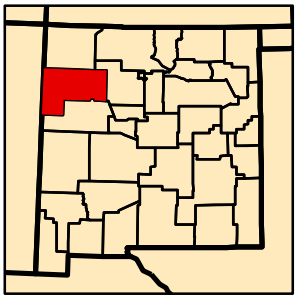
FIGURES



Map Source(s):
Ownership - BLM, 2008

0 7.5 15 30
Miles

NORTH

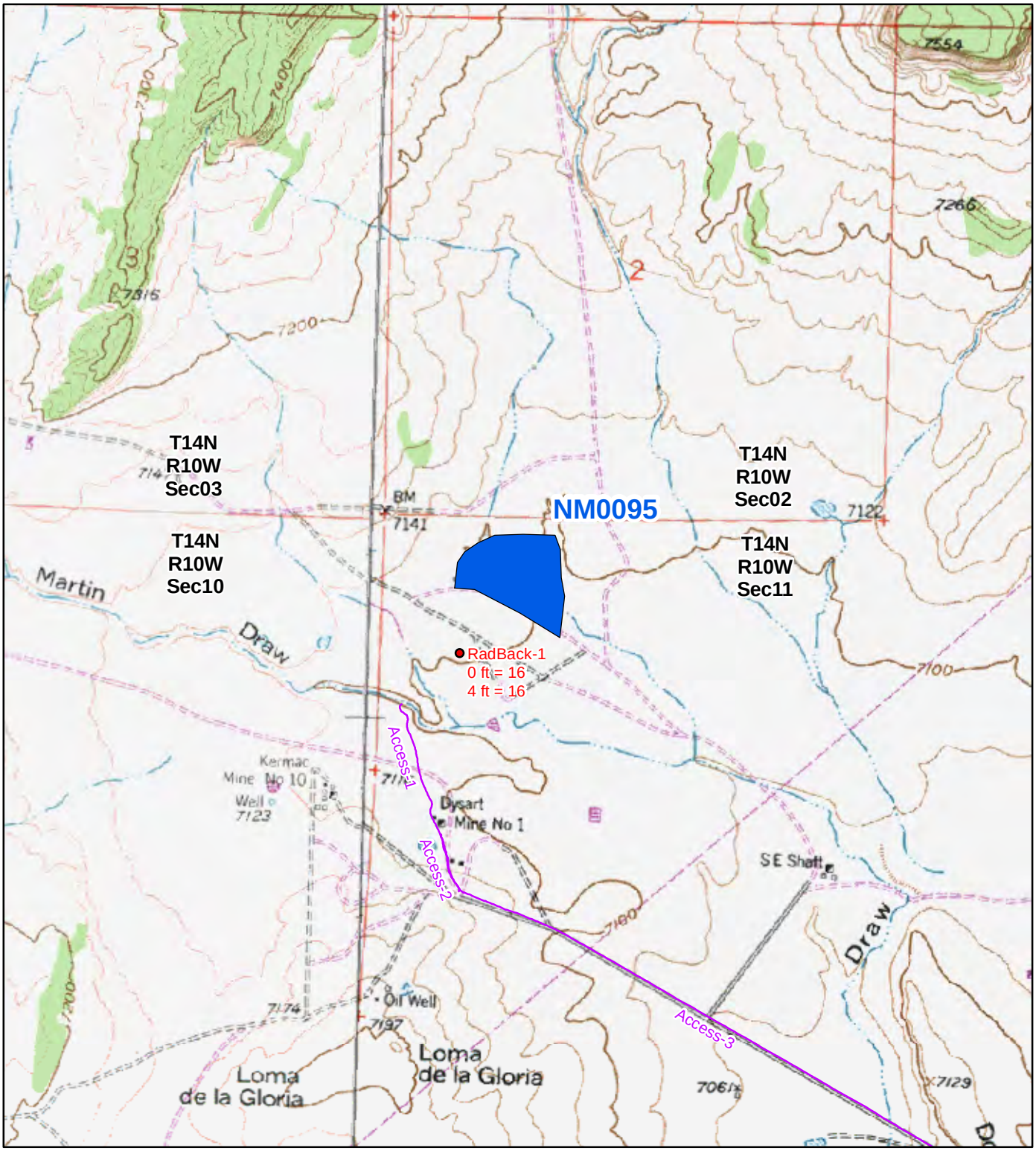


Legend

- AUM Location
- Road
- County Boundary

Figure 1
Site Location Map
NM0095-Mary No. 1
Abandoned Uranium Mine Assessment

File: S:\Projects\EMMD-001_Abandoned Uranium Mine Assessment\Sites\NM0095-Mary_No1\GIS\Map\Site_Map_Mary_CP.mxd 04/21/2010



Map Source(s):
U.S. Geological Survey 7.5-Minute
Topographic Map
-Ambrosia Lake, 1980
-Goat Mountain, 1980

0 750 1,500 3,000
Feet

NORTH

Note:
There are no wells within 1 mile of the Site.

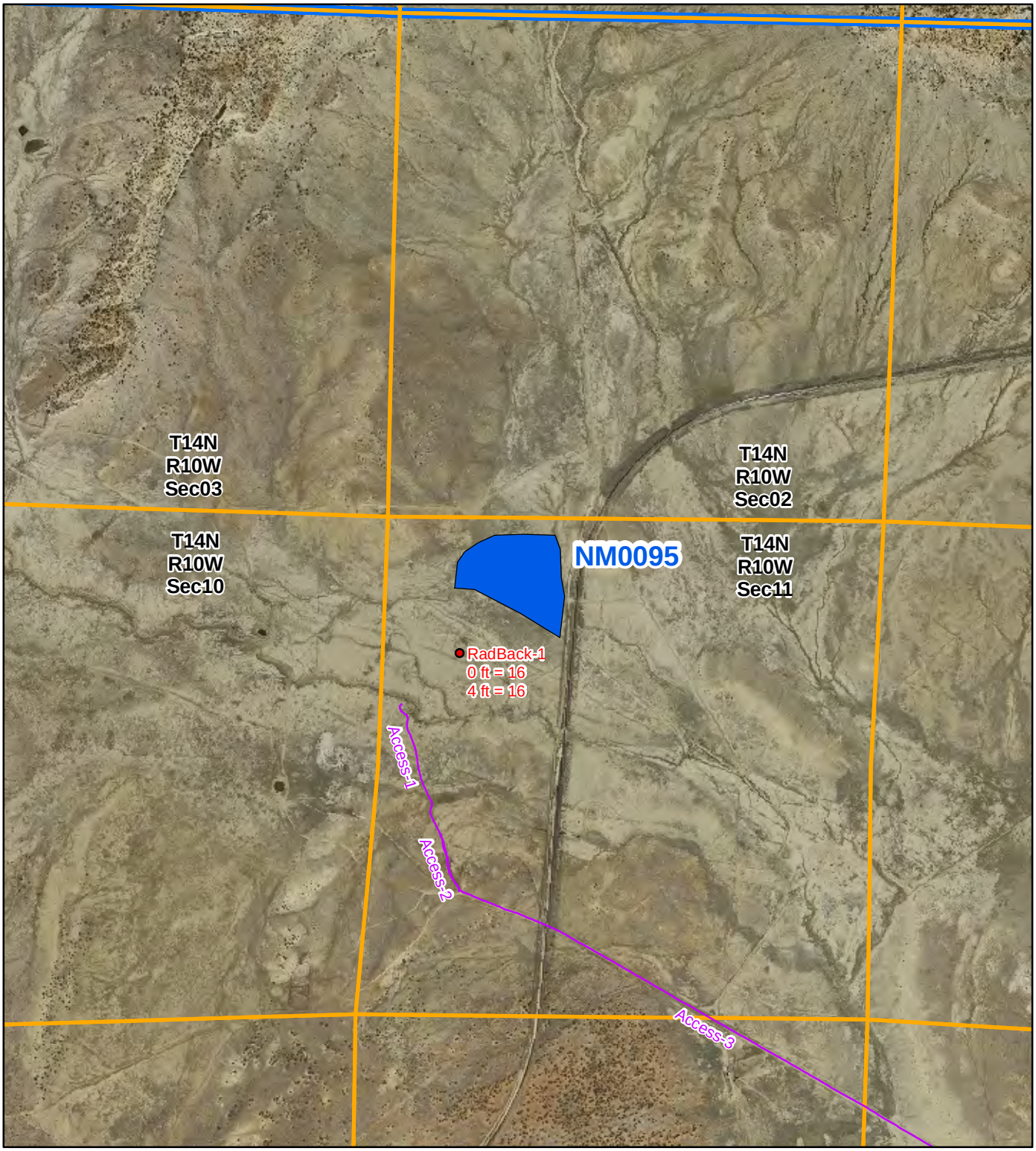
Legend

- Radiation Readings (µR/hr)
- Access Route
- AUM Location Boundary (MMD Provided)

Figure 2
Topographic Map
NM0095-Mary No. 1
Abandoned Uranium
Mine Assessment

INTERA

File: S:\Projects\EMMD-001_Abandoned Uranium Mine Assessment\Sites\NM0095-Mary_No1\GIS\Map\Topo_Map_Mary_CP.mxd 04/23/2010



Map Source(s):
U.S. Geological Survey 7.5-Minute
DOQQ County Mosaic
-McKinley County, 2009

Note:
There are no wells within 1 mile of the Site.

0 750 1,500 3,000
Feet

NORTH

Legend

- Radiation Readings (µR/hr)
- Access Route
- AUM Location Boundary (MMD Provided)
- Section Boundary
- Township/Range Boundary

Figure 3
Aerial Photo
NM0095-Mary No. 1
Abandoned Uranium
Mine Assessment

File: S:\Projects\EMMD-001_Abandoned Uranium Mine Assessment\Sites\NM0095-Mary_No1\GIS\Map\Aerial_Map_Mary_CP.mxd 04/23/2010

Legend

- Radiation Readings (µR/hr)
- Miscellaneous Feature
- Photo Location
- Access Route
- Other Disturbance Area

0 75 150 300
Feet

NORTH

Map Source(s):
U.S. Geological Survey 7.5-Minute
DOQQ County Mosaic
-McKinley County, 2009

Figure 4a
Site Map on
Aerial Photo
NM0095-Mary No. 1
Abandoned Uranium
Mine Assessment

File: S:\Projects\EMMD-001_Abandoned Uranium Mine Assessment\Sites\NM0095-Mary_No1\GIS\Map\CloseupAerial_Map_Mary_CP.mxd 04/21/2010

Rad-11
0 ft = 39
4 ft = 45

Photo-6-9

RadBack-1
0 ft = 16
4 ft = 16

Rad-3
0 ft = 16
4 ft = 16

Rad-10
0 ft = 16
4 ft = 16

Rad-1
0 ft = 17
4 ft = 17

Rad-9
0 ft = 17
4 ft = 16

Rad-2
0 ft = 18
4 ft = 19

DistPly-1

Rad-4
0 ft = 17
4 ft = 16

MiscPt-1

Photo-1

Rad-5
0 ft = 15
4 ft = 15

Rad-6
0 ft = 16
4 ft = 16

Rad-7
0 ft = 17
4 ft = 16

Rad-8
0 ft = 16
4 ft = 16

Access-1

Legend

- Radiation Readings (µR/hr)
- Miscellaneous Feature
- Photo Location
- Access Route
- Other Disturbance Area

Surface Ownership

- Bureau of Land Management
- Private

0 75 150 300
Feet

NORTH

Map Source(s):
Ownership - BLM, 2008

Figure 4b
Site Map with Surface Ownership
NM0095-Mary No. 1
Abandoned Uranium Mine Assessment

File: S:\Projects\EMMD-001_Abandoned Uranium Mine Assessment\Sites\NM0095-Mary_No1\GIS\Map\CloseupOwnership_Map_Mary_CP.mxd 04/21/2010

APPENDIX A

PHOTO LOG

Note: Gaps in the numbering sequence of the photos is the result of removing photos not suitable for the report. A full set of photos is provided in the electronic deliverable.

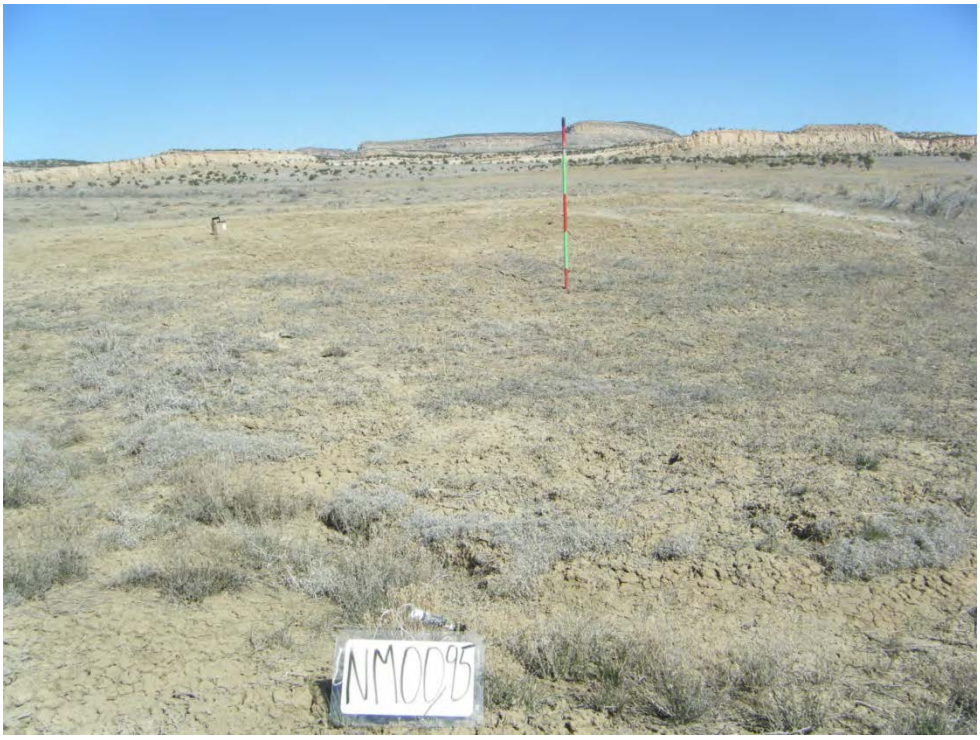


Photo 1-Site photo, looking northwest.

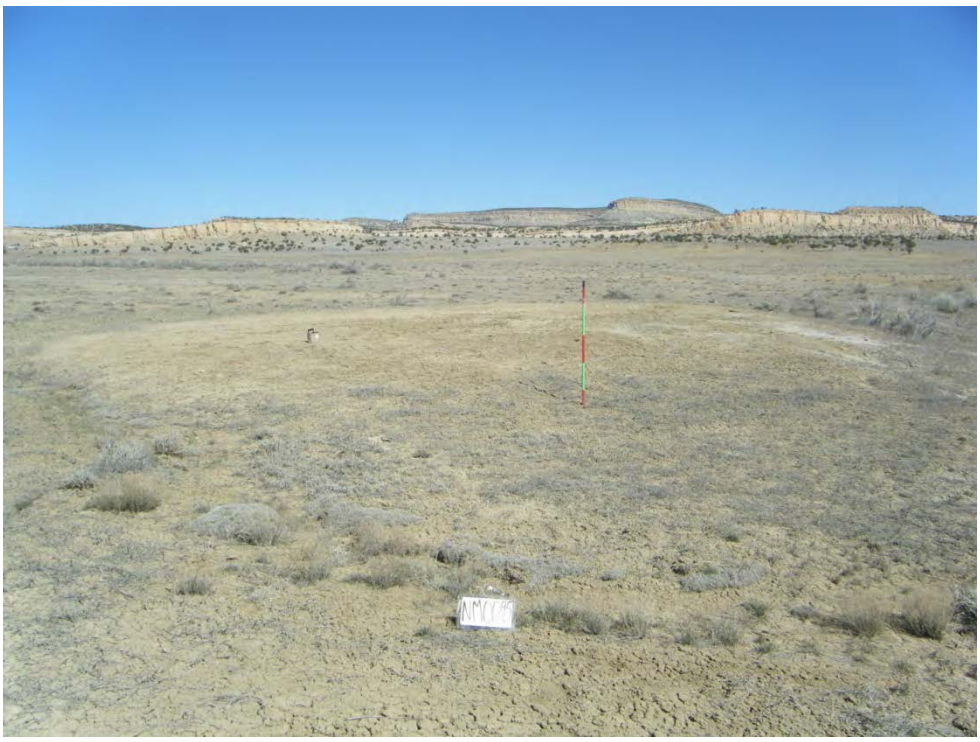


Photo 2-Looking northwest at DistPly-1.

Photo 3-Looking southwest at DistPly-1.

Photo 4-A vent shaft (MiscPt-1) in DistPly-1.

Photo 5-View down vent shaft (MiscPt-1).

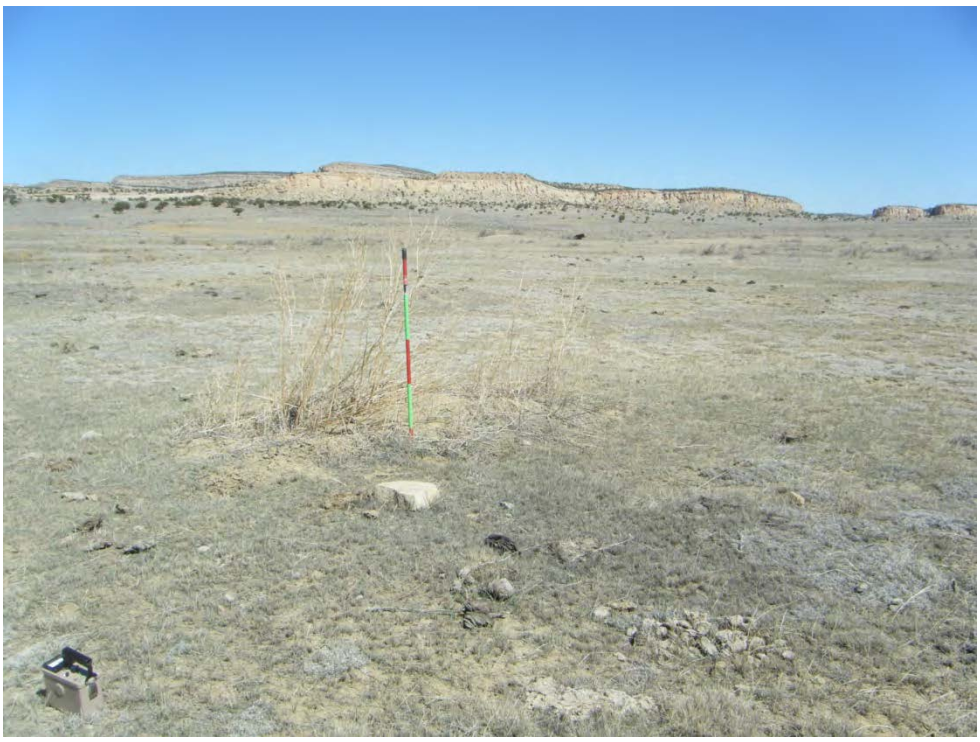


Photo 6-At MMD provided shapefile location, looking north.

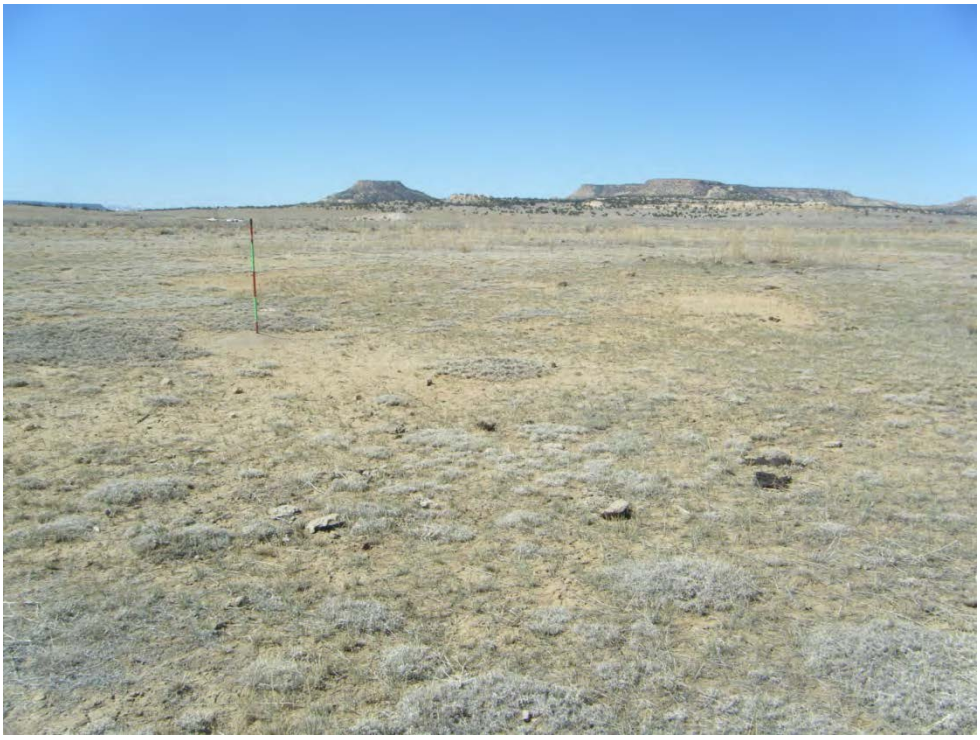


Photo 7- At MMD provided shapefile location, looking west.

Photo 8- At MMD provided shapefile location, looking south.

Photo 9- At MMD provided shapefile location, looking east.

APPENDIX B

FIELD NOTES

153 4/9/10 AUT Abandoned Uranium Mines

Site Name: NM0095, Mary No. 1

Objective: Site Assessment

Personnel: AUT Annelia Tinklenberg
Danny Bowman

Equipment: Rental truck, Trimbel GeoXM (SN: 4948447271), AUT 2008 series), Ludlum 192 (SN: 234149), Fujifilm digital camera (No. 80839493), backup Garmin GPS, cell phone amplifier, field laptop

830 Meeting at Homestake headquarters on NM605 with Al Cox (Homestake), George Lotspeich and Richard Stevenson (Property owners), Rob Sengebush (INTERA). DCB 5-25-10

930 At AUM site
Al and George showed us where the old sites are. Mary No. 1 has been reclaimed. subsidence feature and shaft filled in.

1000
Background Rad; 0m - 16 DCB 5-25-10 uR/h; 1m - 16 DCB 5-25-10 uR/h

Dist Ply-1 - 2' high, 60' wide, 90' long

Photo-1 - site Name, location looking northwest
Photo-2 - looking northwest at Dist Ply-1
Photo-3 - looking southwest at Dist Ply-1

4/9/10 AUT Abandoned Uranium Mines 154

MiscPt-1 - vent shaft; 1' diameter, ~~2~~ 6' AUT deep
the bottom is AUT visible, with ~5" pvc pipe
Photo 4 - miscPt-1 looking west
Photo 5 - miscPt-1 looking in

Rad 1 - miscPt; 0m - 17 uR/h; 1m - 17 uR/h

Rad 2 - Dist Ply-1; 0m - 18 uR/h; ~~1m~~ AUT 0m 1m - 19 uR/h
Rad 3 - Dist Ply-1; 0m - 16 uR/h; 1m - 16 uR/h
Rad 4 - Dist Ply-1; 0m - 17 uR/h; 1m - 16 uR/h
Rad 5 - Dist Ply-1; 0m - 15 uR/h; 1m - 15 uR/h
Rad 6 - Dist Ply-1; 0m - 16 uR/h; 1m - 16 uR/h
Rad 7 - Dist Ply-1; 0m - 17 uR/h; 1m - 16 uR/h
Rad 8 - west of Dist Ply-1; 0m - 16 uR/h; 1m - 16 uR/h
Rad 9 - north west of AUT Dist Ply-1; 0m - 17 uR/h; 1m - 16 uR/h
Rad 10 - north of Dist Ply-1; 0m - 16 uR/h; 1m - 16 uR/h

1045 At polygon location, no features
Rad 11 - 0m - 39 uR/h; 1m - 45 uR/h
Photo 6 - looking north
Photo 7 - looking west
Photo 8 - looking south
Photo 9 - looking east

Homestake environmental manage, Al Cox said this was not the site of Mary No. 1

Soils, rocks, human activities, wildlife same as NM0041, Dysart No. 1, the following assessment.

AUT

157 4/9/10 ALT Abandoned Uranium Mines

Soils: Tan sandy

Rocks: No rock outcrop in the vicinity, the target ore was in the Westwater Canyon Member. Loose westwater canyon scattered across the site.

Human Activities: Grazing; fences, cattle gaurds, Past mining.

Wildlife: evidence of rabbits.